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09/605,334	06/27/2000	Daniel Geist	6727/0H560	3652

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Darby & Darby PC
805 Third Avenue
New York, NY 10022

EXAMINER

STEVENS, THOMAS H

ART UNIT	PAPER NUMBER
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2123

DATE MAILED: 05/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/605,334

Applicant(s)

GEIST ET AL.

Examiner

Thomas H. Stevens

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 March 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-32 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 4/29/05
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

1. Claims 1-32 were examined.

Section I: Response to Applicant's Amendment (2nd Non-Final Action)

Drawings

2. Objection stands: applicants were non-committal to this issue.

Information Disclosure Statement

3. Applicants are thanked for addressing this issue. Objection is withdrawn based on applicant's amendment.

35 USC § 112

4. Applicant's explanation of the word "associated" relative to the claims is persuasive. Rejection is withdrawn.

35 USC § 103

5. Applicants are thanked for addressing this issue. Applicants state that Cleveland et al. doesn't teach or suggest "finite state machines", "tableau states" and "no tableau transitions". However, Cleveland et al. notes that tableau-based mu-calculus is significant to the model checker to eliminate redundant portions of the state space (Cleveland et al: column 4, lines 35-40). Without creating a tableau via mu-calculus (Cleveland "A Tableau-based Model Checking..."), the simulation of the state machine for redundant states would not occur (refuting applicant's argument: pg.4, 1st paragraph)

Furthermore, applicants state that *"in model checking a verification engineer writes a set of properties (known as a specification) that a design is expected to fulfill (applicant's argument: pg. 2, 3rd paragraph, lines 5-8); examiner finds the statement equivalent to Cleveland et al., which states " in a system design, some aspects (e.g., system architecture) are best captured graphically {column 3, lines 16-19}...model checking is used to decide if a system satisfies a temporal-logic formula {column 3, lines 65-66}"*. Summarily, rejection stands.

Section II: Final Rejection (3rd Office Action)

Drawings

6. Figure 1 discloses generic electronic devices and thus should be labeled as prior art.

Claim Rejections - 35 USC § 103

7. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 1-32 are rejected under 35 U.S.C. 103(a) as being unpatentable by

Cleveland ("Tableau-base Model Checking in the Proportional Mu-Calculus" (1990)) in view of Cleveland et al. (U.S. Patent 6,385,765 (2002)). Cleveland teaches a procedure based around the construction of tableau proofs. While the paper briefly discloses model checking, it doesn't teach it from a software standpoint. Cleveland et al., teaches a method of specifying software in a design language possessing formal semantics; simulating the design in accordance with its formal semantics (abstract). At the time of invention, it would have been obvious to one of ordinary skill in the art to modify Cleveland (paper) with Cleveland et al (patent) to identify redundant portions of the state space form analysis (Cleveland Patent: column 4, lines 33-36).

Claim 1. A method for verification, comprising (Patent: column 1, lines 15-19): providing an implementation model, which defines model states of a target system (Patent: column 5, lines 25-30) and model transitions between the model states; providing a specification of the target system, (Patent: column 5, lines 25-30) comprising properties that the system is expected to obey; creating a tableau from the specification, (Patent: column 2, lines 30-37) the tableau defining tableau states (Paper: section 3) with tableau transitions between the tableau states in accordance with properties (Paper: section 3, pg.7, 2nd paragraph); and comparing the tableau transitions to the model

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transitions to determine whether a discrepancy exists there between (Patent: column 2, lines 30-37).

Claim 2. A method according to claim 1, (Patent: column 1, lines 15-19; column 5, lines 25-30; column 2, lines 30-37; Paper: section 3, pg.7, 2nd paragraph) wherein creating the tableau comprises defining a finite state machine (Patent: column 2, lines 30-36) using a hardware description language (textual language; Patent: column 3, lines 7-10).

Claim 3. A method according to claim 2, (Patent: column 1, lines 15-19; column 5, lines 25-30; column 2, lines 30-37; Paper: section 3, pg.7, 2nd paragraph; Patent: column 2, lines 30-36; textual language; Patent: column 3, lines 7-10) wherein the implementation model has model inputs and outputs (inherent to any software: Patent: column 3, lines 45-54), and wherein defining the finite state machine comprises describing a virtual device (the device to be tested: Patent: column 3, lines 62-67) having inputs and outputs corresponding to the model inputs and outputs of the implementation model.

Claim 4. A method according to claim 3, (Patent: column 1, lines 15-19; column 5, lines 25-30; column 2, lines 30-37; Paper: section 3, pg.7, 2nd paragraph; Patent: column 2, lines 30-36; textual language; Patent: column 3, lines 7-10; the device to be tested: Patent: column 3, lines 62-67)) wherein comparing the transitions comprises performing a reachability analysis (Paper: pg. 19, section 5, paragraphs 1-3 with figure 7) using both the implementation model and the tableau while providing identical inputs to the

inputs of both the implementation model and the tableau, and verifying that the outputs are always identical.

Claim 5. A method according to claim 4, (Patent: column 1, lines 15-19; column 5, lines 25-30; column 2, lines 30-37; Paper: section 3, pg.7, 2nd paragraph; Patent: column 2, lines 30-36; textual language; Patent: column 3, lines 7-10; the device to be tested: Patent: column 3, lines 62-67; Paper: pg. 19, section 5, paragraphs 1-3 with figure 7) wherein performing the reachability analysis comprises comparing the model and the tableau automatically using a model checker (Patent: column 2, lines 38-42; column 4, lines 10-19).

Claim 6. A method according to claim 4, (Patent: column 1, lines 15-19; column 5, lines 25-30; column 2, lines 30-37; Paper: section 3, pg.7, 2nd paragraph; Patent: column 2, lines 30-36; textual language; Patent: column 3, lines 7-10; the device to be tested: Patent: column 3, lines 62-67; Paper: pg. 19, section 5, paragraphs 1-3 with figure 7) wherein performing the reachability analysis comprises providing evidence of a tableau transition that is not implemented in the model (Paper: pg. 19, section 5, paragraphs 1-3 with figure 7; with graphical user interface).

Claim 7. A method according to claim 1, (Patent: column 1, lines 15-19; column 5, lines 25-30; column 2, lines 30-37; Paper: section 3, pg.7, 2nd paragraph) wherein comparing the tableau transitions comprises associating (not address: the word "associated" in the

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context of the claims is unclear-- redundant) model transitions with corresponding tableau transitions.

Claim 8. A method according to claim 7 (Patent: column 1, lines 15-19; column 5, lines 25-30; column 2, lines 30-37; Paper: section 3, pg.7, 2nd paragraph), wherein associating (not address: the word "associated" in the context of the claims is unclear-- redundant) the transitions comprises defining a reachable simulation preorder relating the model and the tableau (Paper: pg. 19, section 5, paragraphs 1-3 with figure 7; with graphical user interface).

Claim 9. A method according to claim 7, (Patent: column 1, lines 15-19; column 5, lines 25-30; column 2, lines 30-37; Paper: section 3, pg.7, 2nd paragraph) wherein associating (not address: the word "associated" in the context of the claims is unclear-- redundant) the transitions comprises finding a tableau transition that is not implemented in the model.

Claim 10. A method according to claim 9, (Patent: column 1, lines 15-19; column 5, lines 25-30; column 2, lines 30-37; Paper: section 3, pg.7, 2nd paragraph) wherein finding the tableau transition that is not implemented in the model comprises deriving an indication (Patent: column 6, lines 18-24), based on the unimplemented transition, that the specification is not complete with respect to the model (Patent: column 6, lines 41-51).

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Claim 11. A method according to claim 9, (Patent: column 1, lines 15-19; column 5, lines 25-30; column 2, lines 30-37; Paper: section 3, pg.7, 2nd paragraph) wherein finding the tableau transition that is not implemented in the model comprises deriving an indication, based on the unimplemented transition, that a transition of the target system is missing in the model.

Claim 12. A method according to claim 1, (Patent: column 1, lines 15-19; column 5, lines 25-30; column 2, lines 30-37; Paper: section 3, pg.7, 2nd paragraph) and comprising associating model states with corresponding tableau states.

Claim 13. A method according to claim 12, (Patent: column 1, lines 15-19; column 5, lines 25-30; column 2, lines 30-37; Paper: section 3, pg.7, 2nd paragraph) wherein associating the model states with the corresponding tableau states comprises finding a tableau state that is not implemented in the model.

Claim 14. A method according to claim 13, (Patent: column 1, lines 15-19; column 5, lines 25-30; column 2, lines 30-37; Paper: section 3, pg.7, 2nd paragraph) wherein finding the tableau state that is not implemented in the model comprises deriving an indication (simulation menu bar indicates status: Patent: column 6, lines 52-58 and column 5, lines 49-58) based on the unimplemented state, that the specification is not complete with respect to the model.

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Claim 15. A method according to claim 13, (Patent: column 1, lines 15-19; column 5, lines 25-30; column 2, lines 30-37; Paper: section 3, pg.7, 2nd paragraph) wherein finding the tableau state that is not unimplemented in the model comprises deriving an indication, (simulation menu bar indicates status: Patent: column 6, lines 52-58 and column 5, lines 49-58) based on the unimplemented state, that a state of the target system is missing in the model.

Claim 16. A method according to claim 12, (Patent: column 1, lines 15-19; column 5, lines 25-30; column 2, lines 30-37; Paper: section 3, pg.7, 2nd paragraph) wherein associating the model states with the corresponding tableau states comprises finding multiple model states (Patent: column 5, lines 38-46) corresponding a single tableau state (Paper: pg. 19, section 5, paragraphs 1-3 with figure 7).

Claim 17. A method according to claim 1, (Patent: column 1, lines 15-19; column 5, lines 25-30; column 2, lines 30-37; Paper: section 3, pg.7, 2nd paragraph) wherein creating the tableau comprises creating a reduced tableau (Patent: column 8, claim 2; Paper: section 3) from which one or more redundant states have been eliminated (Patent: column 10, claim 35).

Claim 18. A method according of claim 1, (Patent: column 1, lines 15-19; column 5, lines 25-30; column 2, lines 30-37; Paper: section 3, pg.7, 2nd paragraph; Patent: column 8, claim 2; Paper: section 3) wherein comparing the transitions comprises

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verifying that the specification is a complete and correct description of the implementation (Patent: column 8, claim 5) model responsive to the comparison.

Claim 19. A verification processor (Patent: column 10, claims 44) which is configured to receive an implementation model, defining model states of a target system (Patent: column 5, lines 25-30) and model transitions between the model states and to receive a specification of the target system, including properties that the system is expected to obey, and which is operative to create a tableau from the specification (Paper: section 3; Patent: column 8, claim 5), the tableau defining tableau states with tableau transitions between the tableau states in accordance with the properties, (Paper: section 3, pg.7, 2nd paragraph) and to compare the tableau transitions to model transitions to determine whether a discrepancy exists there between (Patent: column 2, lines 30-37).

Claim 20. A processor according to claim 19, (Patent: column 1, lines 15-19; column 5, lines 25-30; column 2, lines 30-37; Paper: section 3, pg.7, 2nd paragraph) which is operative to perform model checking of the implementation model.

Claim 21. A computer software product for verification of a specification of a target system (Patent: title and column 5, lines 25-30), which specification includes properties that the system is expected to obey, by comparison with an implementation model which defines model states (Patent: column 2, lines 29-37) between the model states, the product comprising a computer-readable medium having computer program

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instructions recorded therein, which instructions, when read by a computer, cause the computer to create a tableau (Paper: section 3) from the specification, the tableau defining tableau states with tableau transitions between the tableau states (Paper: section 3, pg.7, 2nd paragraph) in accordance with the properties, and to compare the tableau transitions to the model transitions to determine whether a discrepancy exists there between (Patent: column 2, lines 30-37).

Claim 22. A product according to claim 21, (Patent: column 1, lines 15-19; Patent: column 5, lines 25-30; Patent: column 5, lines 25-30; Patent: column 2, lines 30-37; Paper: section 3, pg.7, 2nd paragraph; Patent: column 2, lines 30-37) wherein the program instructions cause the computer to compare the tableau with the model by running a reachability analysis (Paper: pg. 19, section 5, paragraphs 1-3 with figure 7) using both the implementation model and the tableau while providing identical inputs to the inputs of both the implementation model and the tableau, and verifying that the outputs are always identical.

Claim 23. A product according to claim 22, (Patent: column 1, lines 15-19; Patent: column 5, lines 25-30; Patent: column 5, lines 25-30; Patent: column 2, lines 30-37; Paper: section 3, pg.7, 2nd paragraph; Patent: column 2, lines 30-37; Paper: pg. 19, section 5, paragraphs 1-3 with figure 7) wherein reachability analysis is performed using an automatic model checker (Patent: column 9, claims 14-17; column 4, lines 10-19).

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Claim 24. A product according to claim 21, (Patent: column 1, lines 15-19; Patent: column 5, lines 25-30; Patent: column 5, lines 25-30; Patent: column 2, lines 30-37; Paper: section 3, pg.7, 2nd paragraph; Patent: column 2, lines 30-37) wherein the instructions cause the computer to verify that the specification (Patent: column 10, claim 35) is a complete description of the implementation model.

Claim 25. A method for verification, comprising (Patent: column 1, lines 15-19): providing an implementation model, which defines model states of a target system (Patent: column 5, lines 25-30) and model transitions between the model states; providing a specification of the target system, (Patent: column 5, lines 25-30) comprising properties that the system is expected to obey; creating a tableau from the specification, the tableau defining tableau states with tableau transitions between the tableau states (Paper: section 3) in accordance with the properties (Paper: section 3, pg.7, 2nd paragraph); and comparing the model and the tableau by inputting the model and the tableau to an automatic model checking program (Patent: column 4, lines 10-19).

Claim 26. A method according to claim 25, (Patent: column 1, lines 15-19; Patent: column 5, lines 25-30; Patent: column 5, lines 25-30; Paper: section 3; Paper: section 3, pg.7, 2nd paragraph) wherein creating the tableau comprises defining a finite state machine (Patent: column 2, lines 30-36) using a hardware description language (textual language; Patent: column 3, lines 7-10).

Claim 27. A method according to claim, 26 (Patent: column 1, lines 15-19; Patent: column 5, lines 25-30; Patent: column 5, lines 25-30; Paper: section 3; Paper: section 3, pg.7, 2nd paragraph) wherein the input model has model inputs and outputs, and wherein defining the finite state machine comprises describing a virtual device (the device to be tested: Patent: column 3, lines 62-67) having inputs and outputs corresponding to the model inputs and outputs of the implementation model.

Claim 28. A method according to claim 27, (Patent: column 1, lines 15-19; column 5, lines 25-30; column 2, lines 30-37; Paper: section 3, pg.7, 2nd paragraph; Patent: column 2, lines 30-36; textual language; Patent: column 3, lines 7-10; the device to be tested: Patent: column 3, lines 62-67)) wherein comparing the model and the tableau comprises running the model checker (Patent: column 9, claims 14-17) while providing identical inputs to the inputs of both the implementation model (Patent: column 2, lines 30-46) and the tableau, (Paper: section 3, pg.7, 2nd paragraph) and verifying that the outputs are always identical.

Claim 29. A method according to claim 25, (Patent: column 1, lines 15-19; Patent: column 5, lines 25-30; Patent: column 5, lines 25-30; Paper: section 3; Paper: section 3, pg.7, 2nd paragraph) wherein comparing the model and the tableau comprises providing evidence of a transition or state in the tableau (Paper: section 3 with Patent: column 6, lines 38-51) that is not implemented in the model.

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Claim 30. A method according to claim 29, (Patent: column 1, lines 15-19; Patent: column 5, lines 25-30; Patent: column 5, lines 25-30; Paper: section 3; Paper: section 3, pg.7, 2nd paragraph) wherein providing the evidence comprises providing a counter-example ("counter-example": errors in other words as stated on page 19 of the specification: Patent: column 1, lines 51-56 and column 6, lines 38-51) indicative of the unimplemented transition or state.

Claim 31. Model checking apparatus, (Patent: column 1, lines 15-19; Patent: column 5, lines 25-30; Patent: column 5, lines 25-30; Patent: column 2, lines 30-37; Paper: section 3, pg.7, 2nd paragraph; Patent: column 2, lines 30-37; Paper: pg. 19, section 5, paragraphs 1-3 with figure 7) which is configured to receive an implementation model, defining model states of a target system and model transitions between the model states, and to receive a specification of the target system, (Patent: column 5, lines 25-30) including properties that the system is expected to obey, and which is operative to create a tableau from the specification (Patent: abstract with Paper: section 3), the tableau defining tableau states (Paper: section 3) with tableau transitions between the tableau states in accordance with the properties and to compare the tableau to the model by inputting the model and the tableau to an automatic model checking program (Patent: column 9, claims 14-17; column 4, lines 10-19).

Claim 32. A computer software product for verification (Paper: Introduction, pg. 1 and Patent: column 9, claim 24) of a specification of a target system, which specification

includes properties that the system is expected to obey, by comparison with an implementation model, which defines model states of the target system (Patent: column 5, lines 25-30) and model transitions between the model states, the product comprising a computer-readable medium having computer program instructions recorded therein, which instructions, when read by a computer, cause the computer to create a tableau (Paper: pg. 1, Introduction and pg.6 section 3) from the specification(Patent: column 10, claim 35), the tableau defining tableau states with tableau transitions between the tableau states in accordance with the properties ("the properties" is undefined), and to compare the tableau to the model by inputting the model and the tableau to an automatic model checking program (Paper: Introduction, pg. 1 and Patent: column 9, claim 24 with column 4, lines 10-19).

Conclusion

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

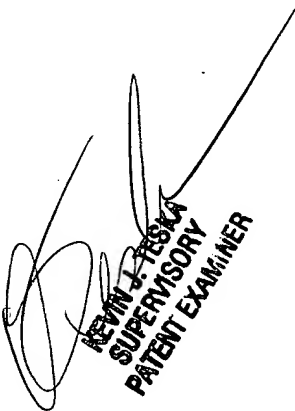
Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mr. Tom Stevens whose telephone number is 571-272-3715, Monday-Friday (8:00 am- 4:30 pm) or contact Supervisor Mr. Kevin Teska at (571) 272-3716. Fax number is 571-273-3715.

Any inquiry of a general nature or relating to the status of this application should be directed to the TC 2100 Group receptionist: 571-272-2100.

April 22, 2005

THS



KEVIN J. TESKA
SUPERVISORY
PATENT EXAMINER